SBIR

Small Business Innovation Research Program

ABSTRACTS OF PHASE II AWARDS FOR FISCAL YEAR 2023

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration

INTRODUCTION

The Department of Commerce (DOC), National Oceanic and Atmospheric Administration (NOAA), awarded 17 NOAA SBIR Phase II contracts for FY 2023, through the Small Business Innovation Research (SBIR) program.

In Phase II, funding is provided for projects that are most promising after Phase I is completed from the previous year. These awards are up to $650,000 each, totaling approximately $11M in FY 2023. The awards are for a two-year effort to continue the research and development of the innovative approach they proposed during the Phase I project. Abstracts of successful Phase II proposals and comments on their anticipated results are also provided in this publication.

Fiscal Year 2023 Phase II List of Awardees

Award Number	Company Name	Topic Number
NA23OAR0210332	60Hertz Incorporated	9.2
NA23OAR0210337	ACME AtronOmatic, LLC DBA MyRadar	9.2
NA23OAR0210331	Aerodyne Research, Inc.	9.3
NA23OAR0210336	Ai.Fish	9.3
NA23OAR0210342	AirMettle, Inc.	9.1
NA23OAR0210341	Biospherical Instruments, Inc.	9.3
NA23OAR0210338	Blue Ocean Gear, Inc.	9.3
NA23OAR0210326	CoastalOceanVision, Inc.	9.3
NA23OAR0210330	Dragoon Technology LLC	9.2
NA23OAR0210340	Field Data Services, LLC	9.3
NA23OAR0210333	FPN LLC	9.3
NA23OAR0210327	Geometric Data Analytics	9.4
NA23OAR0210329	Improving Aviation, LLC	9.2
NA23OAR0210339	Intellisense Systems, Inc.	9.2
NA23OAR0210334	Morphobotics LLC dba Robotics 88	9.2
NA23OAR0210328	Ocean's Balance Inc	9.3
NA23OAR0210335	Weathervane Labs, LLC	9.2

FY 2023 PHASE II AWARD WINNER

FIRM:	60Hertz Incorporated 911 W 8th Ave Anchorage, AK 99501
AWARD:	$649,950.00
PHONE:	970-355-9221
E-MAIL:	piper.wilder@60hertzenergy.com
PRINCIPAL INVESTIGATOR (PI):	Piper Foster Wilder
TITLE OF PROJECT:	Artificial Intelligence (AI) based algorithms for predictive maintenance using NOAA data-sets for renewable energy assets
TOPIC NUMBER:	9.2

TECHNICAL ABSTRACT:

This research aims to develop decision support tools for better maintenance and planning of renewable energy generation and storage assets using atmospheric, local weather, and on-ground environmental data blended with site-, regional- and national-generation data. The study will use a combination of these data to understand the relationship between non-cloud cover based atmospheric conditions and the impact on renewable energy generation and storage which will then be used to develop models for planning and decision support for operations. Research will be conducted across multiple renewable generation and storage sites with diverse environmental conditions to validate and verify the existing model developed during Phase I of this research. The expected results of this research include a better understanding of the relationship between atmospheric conditions and the impact on renewable energy generation and storage, the development of a decision support tool for proactive and reactionary operations and maintenance, and the potential for commercialization of the model and tools. This research will significantly impact the clean energy generation and storage community by providing real-time insights and accurate, useful predictions that, when leveraged properly, will help clean energy operations & maintenance (O&M) managers ensure optimized operational revenues in both generation and storage asset performance.

SUMMARY OF ANTICIPATED RESULTS:

With this Phase II opportunity, we anticipate the following results:
1. Develop a more robust and comprehensive dataset to increase the validity and reliability of the existing model. 2. Develop and refine predictive models that more accurately forecast the impact of environmental and atmospheric factors on renewable energy generation, storage, and distribution. 3. Further refine the model using advanced machine learning techniques to accurately predict conditions that require maintenance and sustainment operations. 4. Develop decision support tools and early warning systems to improve maintenance planning, optimize cleaning and anti-soiling efforts, and manage demand more effectively. This research will result in product opportunities for utility-scale clean energy, virtual power plant stakeholders, developers, and operators, to include: 1. Weather-Informed Predictive Maintenance Model 2. O&M Dispatch Decision Support Tool 3. O&M Budget Decision Support Tool 4. Design Site Specification Decision Support Tool 5. P50 Model Enhancements (Bibliography/References Cited 5,6)

FY 2023 PHASE II AWARD WINNER

FIRM:	ACME AtronOmatic, LLC DBA MyRadar 111 W Jefferson St. Ste 200 Orlando, FL 32801
AWARD:	$649,864.00
PHONE:	703-624-7612
E-MAIL:	vesh@acmeaom.com
PRINCIPAL INVESTIGATOR (PI):	Sarvesh Garimella
TITLE OF PROJECT:	Orbital Wildfire Resilience (OWR) Phase II will demonstrate a small satellite platform to provide actionable insight to mitigate the growing risks of wildfires for key stakeholder communities
TOPIC NUMBER:	9.2

TECHNICAL ABSTRACT:

The Orbital Wildfire Resilience (OWR) project comprises the innovative combination of MyRadar's miniaturized satellite technology, onboard Artificial Intelligence (AI) processing, and wide-reaching dissemination platform to improve the wildfire hazard resilience of stakeholders. This research facilitates the development of new MyRadar commercial alerting, nowcasting, and satellite imagery Products.

The Phase II mission will be an orbital demonstration of multi-sensor data capture and downlink, and AI assisted low-bandwidth alerting, and training dataset generation. Phase II tasks will include the construction of two 1U HORIS small-satellite pathfinder flight models with ground-validated subsystems, cross-characterization of both flight model sensor suites, launch certification and deployer integration, orbital commissioning, and collection of orbital training data for AI model development.

SUMMARY OF ANTICIPATED RESULTS:

In a changing climate the impact of wildfire-related hazards is anticipated to grow significantly, straining the limited available resources to mitigate their effects, and testing the resilience of the American public and economy to the threats they pose. The R&D conducted within the OWR project serves to catalyze the addition of new consumer-facing hazard alerting products for the MyRadar app and the development of satellite data products to fill gaps in existing hazard reconnaissance as well as result in an increase the resilience of satellite hazard mapping capabilities.

FY 2023 PHASE II AWARD WINNER

FIRM:	Aerodyne Research, Inc. 45 Manning Road Billerica, MA 01821
AWARD:	$649,992.00
PHONE:	978-663-9500
E-MAIL:	proposals@aerodyne.com
PRINCIPAL INVESTIGATOR (PI):	David Gordon
TITLE OF PROJECT:	Novel probes for real time monitoring of dissolved gases and their isotopologues in aquatic ecosystems
TOPIC NUMBER:	9.3

TECHNICAL ABSTRACT:

Ocean ecosystems are critical to the regulation of Earth's climate and biodiversity, while also hosting a range of direct and indirect benefits to people, from being a food source to recreation. Coastal ocean systems are dynamic regions especially rich in diverse biological and geochemical interactions. However, major gaps exist in our knowledge of the primary biogeochemical processes and the factors regulating their relative importance. Nitrous oxide (N2O) and methane (CH4), produced and cycled within coastal and ocean environments are important greenhouse gases with major roles in climate change. Our understanding of the distribution, dynamics, and forcers of the underlying processes controlling their fluxes are limited by a lack of high-resolution spatial-temporal measurements.

The overall objective of this project is to design a field deployable, real-time, in situ system to quantify dissolved greenhouse gases (N2O and CH4) and their isotopologues in ocean ecosystems. In Phase II we will build permeable, hydrophobic probes to extract dissolved gases without intrusion of liquid water; multiplex an array of probes with a field-ready, efficient sample collection and transfer scheme; and interface the probe array and sampling system with high-sensitivity infrared spectrometry. We will demonstrate the field-ready system with deployments at several coastal ecosystems.

SUMMARY OF ANTICIPATED RESULTS:

The proposed research will result in a system for real-time, in situ, spatially resolved measurements of dissolved N2O and its isotopologues, CH4 and its isotopes, and other trace gasses. The proposed technical advances will elevate the entire Aerodyne trace gas product line. The research market includes government, academic, and industrial researchers in the U.S. and abroad studying ocean systems, including marine, coastal, and inland areas, to understand their impact on climate change, to inform water conservation and resource management decisions, and to advise ecological water policy. Industrial applications include quantifying the impact of industrial and agricultural activities upon local water resources and identifying potential pollution concerns.

FY 2023 PHASE II AWARD WINNER

FIRM:	Ai.Fish 424 Iliwahi Loop Kailua, HI, 96734
AWARD:	
PHONE:	808-262-2666
E-MAIL:	jimmy@ai.fish
PRINCIPAL INVESTIGATOR (PI):	James Freese
TITLE OF PROJECT:	Cloud-based Automated Electronic Monitoring for Fisheries of the Future
TOPIC NUMBER:	9.3

TECHNICAL ABSTRACT:

Electronic monitoring (EM) represents a promising opportunity for fishery management of the future. Yet after nearly two decades of implementation less than 1% of the world's fishing fleet are able to participate in these programs. Cost remains a key barrier to the implementation of these programs and the primary cost drivers are manual video review, data transmission and data storage.

Our SBIR Phase I efforts have proven the feasibility of utilizing computer vision and machine learning techniques to analyze EM video with human-level accuracy and resulted in technology at technology readiness level (TRL) 5. The aim of this project is to extend and enhance our technology to a TRL 9 and begin onboarding global customers.

SUMMARY OF ANTICIPATED RESULTS:

After completion of this project our technology will allow the scaling of EM programs in commercial and small-scale fisheries providing decision makers with the fine-grained data they need for effective policy making. We further anticipate that our technology can reduce cost and time requirements of EM by upwards of 80%, while adding value in the form of increased accuracy by upwards of 10%.

FY 2023 PHASE II AWARD WINNER

FIRM:	AirMettle, Inc. 2700 Post Oak Blvd., 21st Floor Houston, TX 77056
AWARD:	$650,000.00
PHONE:	646-872-2124
E-MAIL:	donpaul@airmettle.com
PRINCIPAL INVESTIGATOR (PI):	Donpaul Stephens
TITLE OF PROJECT:	Accelerated in-storage analysis of multi-dimensional data
TOPIC NUMBER:	9.1

TECHNICAL ABSTRACT:

AirMettle Inc. is transforming big data analytics for NOAA and the broader scientific community with a real-time smart data lake solution. Our innovative method utilizes massively parallel in-storage data processing within a versatile software defined storage framework, deployable on-premises or as a cloud based service. Building upon our successful NOAA SBIR Phase I project, we strive to improve the handling of large, multi-dimensional NetCDF4 datasets vital to climate and weather forecasting.

This project incorporates on-demand rescaling, allowing users to directly load only the required data at their desired resolution from the storage service. We will validate the benefits for climatologists and enhance the solution's commercial robustness. Our goal is to accelerate basic operations by 100x and reduce the data retrieved from storage by over 10x for typical requests.

SUMMARY OF ANTICIPATED RESULTS:

The potential commercial applications span meteorology and climatology across various sectors, making it easier and faster for experts to access and analyze crucial climate and weather data. AirMettle's cutting-edge data lake solution is poised to revolutionize big data analytics and garner widespread interest from both public and private stakeholders.

FY 2023 PHASE II AWARD WINNER

FIRM:	Biospherical Instruments, Inc. 5340 Riley Street San Diego, CA 92110
AWARD:	$643,720.00
PHONE:	858-405-2477
E-MAIL:	randy@biospherical.com
PRINCIPAL INVESTIGATOR (PI):	Randall Lind
TITLE OF PROJECT:	Innovative UV Biofouling Mitigation Technique for In-water Optical Sensors
TOPIC NUMBER:	9.3

TECHNICAL ABSTRACT:

This project will build upon research conducted during a Phase I SBIR effort, which showed that germi-cidal UV-C radiation emitted by LEDs installed inside of submerged radiometers can reach levels known to prevent biofouling (accumulation of biological matter) on their external optical surfaces (windows, diffusers) without affecting the instrument's measurements. This technology will improve the long-term accuracy of sensors monitoring the health of the oceans and their data products (e.g., concentration of chlorophyll and dissolved organics). We will build and test multichannel and single-channel radiometers for measuring light (irradiance and radiance) in the ultraviolet, visible, and infrared range. Challenges include the integration of LEDs and other optical elements identified in Phase I into pressure-rated underwater housings that can withstand deployment in the ocean for several months or more without the need of servicing. Once designed and prototyped, these radiometers will be rigorously tested in San Di-ego Bay and in a tidal estuarine river with extremely high biofouling rates. At the end of this project, we anticipate that these radiometers will be ready for sale. We will also re-evaluate published thresholds for the prevention of biofouling and will determine whether the onset of biofouling can be detected in the radiome-ters' measurements.

SUMMARY OF ANTICIPATED RESULTS:

Accurate measurements of sunlight are the basis for biological research and management of the Earth's hydrosphere. Biofouling limits the duration of high accuracy radiometer deployments to relatively short terms (weeks). Long-term in-water moorings must be cleaned regularly at great expense. By offering a technology that can reliably delay or prevent biofouling, the proposed project would open the market for cost-effective, long-term, in-water monitoring applications on underwater observatories, AUVs, buoys, and floats. The new technology would (1) allow persistent real-time in-situ detection of harmful algal blooms and run-offs; (2) help monitor the ecological health of coral reefs, coastal wetlands, estuar-ies, lakes, reservoirs, and irrigation ponds; and (3) support aquaculture operations, which are vulnerable to algal blooms or rapid degradation of water quality from terrestrial run-off. For example, the aquacul-ture market size in the U.S. was estimated at $2.7 billion in 2020; the global market is projected to reach $378 billion by 2027. Most aquaculture operations do not use moored optical radiometers because of biofouling and the associated maintenance cost. Furthermore, General Dynamics Electric Boat, the pri-mary builder of submarines for the US navy, has expressed strong interest in our technology, opening the market for other Department of Defense applications.

FY 2023 PHASE II AWARD WINNER

FIRM:	Blue Ocean Gear, Inc. 914 Edgecliff Way Redwood City, CA 94061
AWARD:	$648,918.00
PHONE:	650-823-1704
E-MAIL:	kortney.opshaug@blueoceangear.com
PRINCIPAL INVESTIGATOR (PI):	Kortney Opshaug
TITLE OF PROJECT:	Enabling Data Measurements Using Smart Buoy Technology On Fishing Gear
TOPIC NUMBER:	9.3

TECHNICAL ABSTRACT:

.As global efforts toward ocean health have gained momentum, it is critical to generate high quality ocean data for industries that operate and/or manage ocean resources. Blue Ocean Gear has demonstrated how Smart Buoys equipped with sensors can be useful to fisheries by tracking gear and providing enhanced marine condition awareness. Building on Phase I efforts, this project will highlight the opportunistic use of fishing gear already out on the water to provide relevant data for adjacent industries. Blue Ocean Gear's combination of hardware and data will result in a powerful means of obtaining better insights to ocean conditions in high spatial granularity for offshore regions.

The proposed project will bring to realization the features required for a low-cost, rugged, sensor-rich Data Buoy. Deployments will demonstrate the value of buoy data from fishing gear in Alaska and/or the Gulf of Mexico for use with meteorologists and offshore wind development. The resulting data products will demonstrate the applicability of these devices for increased markets. The overall outcome will be to bring buoy-generated data into a new realm, where fishing gear can be used to generate high quality data for ocean monitoring and health, and support the responsible operation of marine industries.

SUMMARY OF ANTICIPATED RESULTS:

Customer feedback and market research reflect a strong demand for enhanced and expanded versions of Blue Ocean's Gear Smart Buoy hardware, software, and data set. Beyond the Smart Buoy's ability to track and monitor gear location, insights into the specific ocean conditions present at the location of set gear offers great value to fisheries as well as other ocean industries. The major North American fixed gear fisheries represent hardware demand of $750M and direct recurring software and data demand of $180M annually, excluding third party data customers. On a global scale, the market opportunity is 2-3x that amount.

FY 2023 PHASE II AWARD WINNER

FIRM:	CoastalOceanVision, Inc. 10 Edgerton Drive North Falmouth, MA 02556
AWARD:	$650,000.00
PHONE:	508-472-5520
E-MAIL:	sgallager@coastaloceanvision.com
PRINCIPAL INVESTIGATOR (PI):	Dr. Scott Gallager
TITLE OF PROJECT:	In Situ and Point of Sale Quantification of Human Pathogens Associated with Aquaculture and Shellfish Farming Using Novel Surface Enhanced Raman Spectroscopy
TOPIC NUMBER:	9.3

TECHNICAL ABSTRACT:

There is a dire need for technology to rapidly and accurately detect and quantify Escherichia coli serotypes 0157:H7 and K12 and Vibrio parahaemolyticus and total fecal coliforms. In Phase I we developed a novel approach to Surface Enhanced Raman Spectroscopy (SERS) for detecting human pathogens in cultured bacteria, mixtures of organisms and in oyster tissue. Our approach uses a higher energy laser wavelength (405nm) compared with the lower energy of more the common lasers at 633 and 785nm, a novel mixture and preparation of Ag-coated nano-particles passed through a microfluidic mixing platform, and classification of Raman spectra with a novel 1D Convolutional Neural Network (CNN). Through serial dilutions of cultured bacteria, the detection limit of the SERS platform was evaluated at a dilution of 1:100, which was equivalent to ~100 CFU/mL and a MPN of 44.8 /mL. In Phase II we will further refine the approach and build several units for testing by managers in the field. The microfluidic instrument will allow in situ identification and quantification of pathogen species. Real-time detection of E. coli and other fecal coliforms from buoys or the end of docks would allow for immediate mapping of contamination sources and early response by environmental managers.

SUMMARY OF ANTICIPATED RESULTS:

Potential market segments including federal, regional, state, and municipal managers who must ensure water quality and establish thresholds for pathogens associated with food poisoning in shellfish. Aquatic researchers in academia are early adopters compelled to purchase innovative technologies. Commercial aquaculturists and shellfish growers who make up a larger group are distinguished by their need for rapid, highly accurate measurements that ensure resource quality control and provide early warnings of environmental threats. The cost of preventive measures to combat pathogen contamination is estimated to be ~$6.9 billion annually in the U.S., according to the Economic Research Service (NSSP, 2017). No real-time pathogen detector for E coli and V parahaemolyticus and total fecal coliforms exist on the market today.

FY 2023 PHASE II AWARD WINNER

FIRM:	Dragoon Technology LLC 12855 N Corsair Drive Oro Valley, AZ 85755
AWARD:	$649,781.00
PHONE:	520-991-6974
E-MAIL:	seanculbertson@dragoon.tech
PRINCIPAL INVESTIGATOR (PI):	Sean Culbertson
TITLE OF PROJECT:	Single Use Uncrewed Aircraft with Oceanic Range
TOPIC NUMBER:	9.2

TECHNICAL ABSTRACT:

Low level meteorological data over the world's oceans is hard to collect, due to the cost and difficulty of sensor emplacement. Crewed aircraft are deployed when major weather events arise, but between those major weather events, in-situ data sources are very limited. Uncrewed aircraft systems (UAS) present a unique opportunity to inexpensively collect meteorological data from remote areas, but current systems cannot meet the cost and capability thresholds to make data collection economically viable.

In the preceding Phase I effort, Dragoon demonstrated the ability to carry a meteorological sensor for very long periods, using an internally developed platform to fly a 26-hour, 39-minute data collection mission. This proposal outlines the next steps in developing and testing an optionally disposable UAS platform for weather data collection. The proposed work includes research into novel manufacturing methods to decrease the cost of UAS, as well as hybrid power plant development for increased UAS energy efficiency. A detailed aircraft design will be completed, followed by prototyping of the aircraft in low quantity. The prototypes will be used to collect in-situ data over ocean areas in the vicinity of North and South America. These flights will demonstrate a viable data collection platform for future production deployment in a Phase III setting.

SUMMARY OF ANTICIPATED RESULTS:

Dragoon anticipates that the development and in-situ testing outlined in this proposal will show that low-cost collection of weather data from remote areas using UAS has high value in improving weather forecasts and understanding global weather. Further, the aircraft design developed in the Phase II effort will reach a maturity level sufficient for scaled manufacturing as well as broad, real world data collection to feed NOAA weather models in a future Phase III. The accuracy in predicting the track and severity of Hurricanes can have drastic economic impacts on the communities that they affect. Needlessly evacuating coastal areas has an impact on direct cost, opportunity cost, and human safety.
Current commercial UAS platforms have not yet reached their full potential, wherein they are used ubiquitously for tedious or dangerous jobs. The implications of reaching this potential are that more data can be collected at a much lower cost, with lower risk to human life when the mission puts the aircraft in harm's way. Applications that fit these conditions exist in many commercial spaces, including linear infrastructure inspection, wildfire monitoring, communications relays for disaster response, and package delivery. Dragoon believes that the novel system architecture proposed will change the economics behind the use of UAS today.

FY 2023 PHASE II AWARD WINNER

FIRM:	Field Data Services, LLC 454 Parma Drive Essex MT 59916
AWARD:	$649,679.00
PHONE:	716-587-2570
E-MAIL:	gryphus@gmail.com
PRINCIPAL INVESTIGATOR (PI):	Dr. Constance Woodman
TITLE OF PROJECT:	Automated monitoring of salmonoids in streams with new solid-state LiDar
TOPIC NUMBER:	9.3

TECHNICAL ABSTRACT:

.Maintaining healthy populations of salmon and trout (salmonids) has significant biological, cultural, and economic benefits. Significant data gaps exist for sources of mortality in juvenile and adult salmonids in small streams. These gaps can create discrepancies between main stem escapement counts and estimates of population health. Field Data Services, LLC is developing novel camera trap technology that leverages newly available solid state LiDAR sensor chips for detecting anadromous fish in small streams. This LiDAR chip, introduced in October 2020, uses an infrared laser to measure distances to objects with millimeter accuracy. This breakthrough technology could enable low-cost detection of adult salmonids as they move over shallow riffles, or juveniles underwater. LiDAR chips have been incorporated into an existing field-proven digital platform that includes an AI-enabled smart camera and long-distance wireless link. Our devices are small (2 lbs), portable, and able to be installed without stream channel alterations. This enables deployments across numerous remote and unmonitored streams, or alongside existing survey methods. Following the extensive Phase I laboratory testing, Phase II will add field deployment and data collection. On-board AI will interpret detections and produce tabular data ready for analysis of population health, or to validate restoration of barriers and culverts.

SUMMARY OF ANTICIPATED RESULTS:

Phase II of this project will see a substantial broadening of real world field testing that builds on the extensive laboratory testing in Phase I. Validation of the device's ability to detect and determine size and speed of both adult and juvenile salmonids will drive additions to the device firmware, software and hardware designs. Circuit board subsystems will be enhanced for additional power efficiency and robustness. Automated test fixtures for long-term testing will reveal additional opportunities to improve consistency of firmware and software performance. Ongoing customer interviews will refine the requirements for the user dashboard to ensure that the dashboard and associated data downloads are optimized for compatibility with existing fisheries database tools. An experienced industrial designer will be contracted for advice and direction regarding the evolution from our prototype housings to a waterproof housing for eventual manufacturing. A formal documented list of tasks and technical discoveries will be regularly reviewed to rebalance workloads and ensure that all technical issues are resolved and closed. We will pursue partnerships with fisheries agencies and organizations to develop field deployment methods that will support their ongoing work and enhance, refine and prioritize our feature development toward a self-sustainable manufacturing and consulting business.

FY 2023 PHASE II AWARD WINNER

FIRM:	FPN LLC 74 Orion Street Brunswick, Maine, 04011
AWARD:	$650,000.00
PHONE:	207-751-6809
E-MAIL:	patrickc@phytosmart.com
PRINCIPAL INVESTIGATOR (PI):	Patrick Cregten
TITLE OF PROJECT:	Development and evaluation of peroxide free fin-fish nursery feeds with active DHA-synthase enzyme (DSe)
TOPIC NUMBER:	9.3

TECHNICAL ABSTRACT:

The marine microalgae Chrypthecodinium conhii (C. cohnii) contains high levels of docosahexaenoic acid (DHA) and DHA synthase enzymes (DSe). Finfish have shown de novo synthesis of DHA when fed a C. cohnii product, KoniSap™, developed by FPN LLC. KoniSap™ is unique to the aqua-feed market as it is produced under low temperature and inert gas to prevent lipid oxidation and avoid enzyme denaturation.

This Phase II will conduct Atlantic salmon feeding trials using KoniSap™ aimed to quantify the activity of DSe. The quantification of DSe activity will provide accurate feeding methods to establish sufficient accumulation of DHA in adult fish. The ultimate goal of this research is to demonstrate KoniSap™ production potential and provide the parameters in which aquaculturists can use KoniSap™ to fortify the DHA contents of their product. Increases in DHA concentration in fish provides added value at market.

SUMMARY OF ANTICIPATED RESULTS:

Despite omega-3 additions in aquafeeds through wild caught fish meal / oil, farmed Salmon contains relatively low omega-3 nutrition compared to their wild counterparts. The anticipated result of this effort is the increased omega-3 content of farmed fish by incorporating KoniSap as a supplement in fish feed , thereby improving fish health, nutritional composition, and subsequently increasing its value and price at market. Eventually, FPN LLC foresees KoniSap as an omega-3 component of formulated aquaculture feeds. Aquafeed omega-3 is the leading barrier to aquaculture's sustainability potential. Integration of KoniSap into aquafeeds will reduce the reliance of the aquaculture industry on wild caught fisheries for omega-3 nutrition, leading to a sustainable end product.

Production of KoniSap is a modern cross between biotechnology and manufacturing, occurring through the use of proprietary technology. Another anticipated result of this effort is the demonstration of the scale-up potential of this novel production method that will give FPN LLC's aquafeed omega-3 solution credibility with customers / potential partners.

FY 2023 PHASE II AWARD WINNER

FIRM:	Geometric Data Analytics 343 West Main Street Durham, NC 27701
AWARD:	$649,901.00
PHONE:	919-670-0808
E-MAIL:	megan.bongartz@geomdata.com
PRINCIPAL INVESTIGATOR (PI):	Megan Bongartz
TITLE OF PROJECT:	Deployment Planning, Monitoring, and Navigation for Uncrewed Systems
TOPIC NUMBER:	9.4

TECHNICAL ABSTRACT:

.In Phase I we developed a software capability for predicting the future positions of ocean drifters. We demonstrated the capability to predict drift for objects of varying shapes and train models based on historical observations. In Phase II we will leverage this software to perform high volume experimentation through which we will fully develop trained models using historical data for both passive drifters and uncrewed surface vehicles (USVs) with adjustable sails and rudders. We will perform a demonstration deployment of drifters and collect data to validate both our approach as well as the models we use as inputs. We will work with teams deploying and navigating USVs to perform deployment and route recommendations for a variety of mission types.

SUMMARY OF ANTICIPATED RESULTS:

Our work will result in predictive capabilities and tools that customers will use to more deliberately deploy, manage, and navigate their uncrewed assets. The predictive capabilities we develop will improve mission success for existing systems in scientific research, private sector, and military applications. We have documented the interest in our tools from manufacturers of unmanned systems and the end-users of those products. As these systems become increasingly prevalent, the demand for the tools we develop in this work will grow.

FY 2023 PHASE II AWARD WINNER

FIRM:	Improving Aviation, LLC 6001 S 3rd St Tampa, FL 33611
AWARD:	$649,348.00
PHONE:	386-307-5436
E-MAIL:	rocio@improvingaviation.com
PRINCIPAL INVESTIGATOR (PI):	Rocio Frej Vitalle
TITLE OF PROJECT:	Nowcasting wildfire ember risk in the WUI with WindTL
TOPIC NUMBER:	9.2

TECHNICAL ABSTRACT:

The lack of consistent, accurate information on local wildfire behavior, such as gustiness of winds at wildfire fronts and ember showers is one of the most critical data gaps for wildfire managers. Atmospheric processes in the atmospheric boundary layer significantly influence the behavior of wildfires. Temporal and spatial variability of fine-scale winds at the wildfire front plays a key role in forecasting wildfire spread and spotting events. Available wind information from satellites and numerical weather prediction models does not meet the need for the temporal and spatial resolution for precise modeling of wildfires, especially the fire spread through ember dispersal within wildland-urban interfaces (WUI). The WindTL system is a cutting-edge operational wildfire ember model initialized by hyper-local winds resolved from Unmanned Aerial Systems (UAS) measurements in the wildfire canopy. The hyper-local winds can reveal the near-field dynamics of the buoyant plumes of hot air, offering an unprecedented level of insight into ember spotting behavior. During Phase II, the WindTL system will be enhanced to include propagation characteristics of the fire front and a more educated estimation of the flame height using UAS imagery and fuel models and it will be tested and integrated with current providers of wildfire services.

SUMMARY OF ANTICIPATED RESULTS:

The WindTL model will be further developed during Phase II of the project. Specifically, the ember model developed during Phase I will be enhanced to include propagation characteristics of the fire front and a more educated estimation of the flame height using UAS imagery and fuel models. This will allow for more accurate and informed predictions of wildfire behavior. Additionally, the WindTL model will be tested and integrated with three current providers of wildfire services. By collaborating with these providers, we can ensure that the system is able to meet the needs of those currently working to combat wildfires while also paving the way for future advancements in wildfire tracking and prediction. Customer needs are a significant driving force behind the WindTL initiative. Currently, there is not a commercially available and reliable wildfire ember model to predict what structures are at higher risk of ember ignition. Wildfire suppression managers rely on experience to deploy resources and decide which houses are serviced. With accurate predictions of ember spread and risk of ignition, firefighters can suppress wildfires earlier, and preventive services can be deployed to areas at risk of ember ignition.

FY 2023 PHASE II AWARD WINNER

FIRM:	Intellisense Systems, Inc 21041 S. Western Ave. Torrance, CA 90501
AWARD:	$649,994.00
PHONE:	310- 320-1827
E-MAIL:	notify@intellisenseinc.com
PRINCIPAL INVESTIGATOR (PI):	Selvy Utama
TITLE OF PROJECT:	Flood Location and Alerting
TOPIC NUMBER:	9.2

TECHNICAL ABSTRACT:

To address NOAA's need for technologies conducive to a weather-ready nation, Intellisense Systems, Inc. (Intellisense) proposes, in Phase II, to advance the development of a new Flood Location and Alerting (FLOA) software system proven feasible in Phase I. FLOA is based on integrating data from IoT flood sensors such as Intellisense's AWARE, combined with publicly available data, into Waze, a mobile-based navigation application, and FEMA's IPAWS. Specifically, the innovation in an extensible software platform capable of ingesting sensor and publicly available data and its compatibility with Waze and other mass notification systems will significantly improve the process of disseminating flood hazard information to help reduce loss of life, property, and disruption from high-impact weather events, as well as improving transportation safety and efficiency. As a result, FLOA offers extensibility to integrate with future sensors and multiple notification systems while being easy to deploy. During Phase I, in addition to demonstrating FLOA's feasibility, Intellisense developed FLOA's automated alert system and built relationships with facilitating companies. In Phase II, Intellisense will complete integration of the developed software with IPAWS and other public data sources. Intellisense will also develop a user interface for ease of access to flood hazard information for municipalities.

SUMMARY OF ANTICIPATED RESULTS:

FLOA will immediately impact areas prone to flooding by providing mass notifications to its residents in response to flash flood hazards, thus reducing loss of life and property. Its integration with Waze and other navigation applications will also improve safety and efficiency in navigating travel by alerting and rerouting users and emergency responders to avoid dangerous environments and quickly reach safety. FLOA's extensibility positions itself well for future enhancements, supporting additional sensing modalities, such as lightning, tornados, wildfires, air quality, and seismic sensing. Furthermore, FLOA can be linked to infrastructure for automated tasking with the potential to make a large impact on these trends, integrating IoT sensors of various sensing modalities in combination with ingesting publicly available data, to deliver localized and targeted warnings. FLOA will be immediately accessible to a large cross-section of the population by leveraging HAAS Alert and the Waze software app, which is already used by approximately 140 million people globally, and FEMA's WEA, which can reach all cellular phones in the United States. FLOA also has the potential to integrate with original equipment manufacturers (OEM) of major automotive companies to explore opportunities for integration into manufacturers' head units.

FY 2023 PHASE II AWARD WINNER

FIRM:	Morphobotics LLC dba Robotics 88 47 Wood Ave, Suite 2 Barrington, RI 02806
AWARD:	$649,996.00
PHONE:	508-596-6433
E-MAIL:	erin@robotics88.com
PRINCIPAL INVESTIGATOR (PI):	Dr. Erin Linebarger
TITLE OF PROJECT:	Autonomous Environmental UAV Survey System for Wildfire Assessments
TOPIC NUMBER:	9.2

TECHNICAL ABSTRACT:

Prescribed burns are a critical aspect of land management, but they require vegetation data that is hard to obtain at high resolution and on the timescale required. Our autonomous UAV collects critical fire modeling variables through subcanopy flight, enabling rapid surveys for faster and safer burn planning. In Phase I, we proved the feasibility of mapping live fuel moisture content (LFMC) with subcanopy UAV data, including near and shortwave infrared. To build on this, in Phase II we will enable the UAV to measure the remaining required variables for fire behavior prediction, e.g., canopy base height, stand height, and canopy cover. We additionally propose a method for multi-UAV collaboration to reduce total survey time, since subcanopy flight speeds are limited. This technology will enable burn managers to increase their annual acreage treated with prescribed burns, reducing the risk of catastrophic wildfires at a time when that is critically needed.

SUMMARY OF ANTICIPATED RESULTS:

The anticipated result is an improved fire behavior prediction capability based on our UAV-collected data for rapid, multi-UAV prescribed burn planning surveys. This extends the Phase I proof of concept by adding new vegetation metrics to onboard processing and providing real-world validation. We will demonstrate improved predictions by comparing industry standard wildfire models using our data with the same models using LANDFIRE data, a common source of wildfire prediction inputs, as well as by validating our data on prescribed burns in the Western US. The initial commercial application of this product is in land management as a tool for improving safety and efficiency in hazardous fuel reduction by prescribed burns, but there are additional potential applications in homeowner insurance assessments and wildfire response.

FY 2023 PHASE II AWARD WINNER

FIRM:	Ocean's Balance Inc PO Box 2150 South Portland, Maine, 04116
AWARD:	$650,000.00
PHONE:	917-319-5887
E-MAIL:	mlench@oceansbalance.com
PRINCIPAL INVESTIGATOR (PI):	Mitchell Lench
TITLE OF PROJECT:	Sustainable seed production for North Atlantic kelp aquaculture
TOPIC NUMBER:	9.3

TECHNICAL ABSTRACT:

.Demand for seaweed products has dramatically increased in the U.S.; however, domestic production from both wild harvests and aquaculture operations only supplies 1% of this demand. To meet demand, expansion of seaweed aquaculture is crucial to protect wild populations from extinction by overharvesting, which impacts entire marine ecosystems. Currently, U.S. kelp aquaculture methods rely on wild harvested reproductive tissue, which is not sustainable. In response to NOAA Topic 9.3, Healthy Oceans, Ocean's Balance Inc.—working with the Woods Hole Oceanographic Institution—proposes to develop procedures to scale the growth of skinny kelp (Saccharina latissima forma angustissima) gametophytes in culture to produce a commercial-scale seedstring product that does not rely on repeated wild harvests. Skinny kelp is a fast-growing sister species of sugar kelp native to Maine with more desirable commercial characteristics.
This SBIR project will develop the protocols necessary for scaling production of skinny kelp seedstring at a reasonable market cost, assess the potential to extend the season by outplanting juveniles sporophytes with greater temperature tolerance, and improve the reliability of supply using advanced methods of culturing gametophytes for commercialization. The methods developed in this project will be applicable to other kelp species.

SUMMARY OF ANTICIPATED RESULTS:

This Phase II project will develop methods for commercial-scale production of seedstring inoculated with skinny kelp gametophytes grown in culture. The resulting seedstring product will allow existing aquacultured seaweed farms to expand production, increase yields, and extend their growing season without damaging fragile coastal environments. As a result, existing seaweed aquaculture operations will be able to expand, and more fishermen will be able to augment their income by starting new seaweed farms. Ocean's Balance has a six-year history of growing kelp, partnering with other growers, and developing value-added products that will help ensure the success of this project. There are approximately 45 kelp aquaculture sites in Maine, triple the number 20 years ago, and the industry is still growing. Ocean's Balance expects this project could reduce the cost of kelp seedstring, which constitutes up to half of a farmer's growing expenses, by as much as 50%.

Maine is the U.S. leader in seaweed aquaculture and is well-positioned to remain dominant for years to come. This project will help Ocean's Balance and other Maine seaweed farmers capture a greater share of the U.S. seaweed market, which currently relies on more than $200 million worth of imported seaweed.

FY 2023 PHASE II AWARD WINNER

FIRM:	Weathervane Labs, LLC 400 S 4th St Ste 401-444 Minneapolis, MN 55415
AWARD:	$650,000.00
PHONE:	612-567-0379
E-MAIL:	brian@weathervane.io
PRINCIPAL INVESTIGATOR (PI):	Brian Smoliak
TITLE OF PROJECT:	Novel Personal Thermal Comfort Models for Weather-Ready Decision-Making
TOPIC NUMBER:	9.2

TECHNICAL ABSTRACT:

.In this Phase II project, we will demonstrate a prototype in an operationally-relevant environment for Climatize®, a cloud-based software platform with the novel capability to determine and deliver user-specific thermal comfort information for weather-ready decision-making. People and organizations in a Weather-Ready Nation adapt to weather changes and environmental events with resilience. A challenge of building a Weather-Ready Nation is delivering actionable information that is meaningful based on users' unique physiology, psychology, behavior, and location. For the first time, outdoor enthusiasts and workers will receive weather forecasts personalized through the lens of thermal comfort, the state of mind and physical sensation associated with the thermal environment. This shift in perspective surpasses hyperlocal forecasts by putting each consumer at the center of the weather universe. Climatize has the potential to unlock valuable benefits consistent with NOAA's long-term goals, objectives, and science and technology focus areas, such as new opportunities for citizen science, reduced injury and loss of life, a more productive economy, and more resilient communities adaptive to their environment.

SUMMARY OF ANTICIPATED RESULTS:

Commercialization of the Climatize software platform will provide outdoor enthusiasts and workers with personalized weather information to simplify daily decisions, save time, relieve stress, and potentially save lives by addressing the pain point of being caught off guard by changing weather and climate. It will build weather-readiness by informing choices around clothing, activity, and scheduling, and by creating healthy habits of engagement with weather information and the natural world. This will stimulate recreation economies by highlighting seasonable opportunities for activities and increase savings to individuals, businesses, and society during extreme events by protecting against health costs and lost productivity.